Q1 Modular Arithmetic Basics

4 Points

Q1.1 Definition

1 Point

If $x \equiv a \pmod{m}$, then $x = a + km$ for some $k \in \mathbb{Z}$.

- (●) True
- ( ) False

Explanation

By definition.

Q1.2 Multiplication

1 Point

If $x \equiv 4 \pmod{6}$ and $y \equiv 4 \pmod 6$, what is $xy \pmod{6}$?

- ( ) 0
- ( ) 1
- ( ) 2
- ( ) 3
- (●) 4
- ( ) 5

Explanation

To find the remainder when xy is divided by 6, we can multiply the individual remainders to get 16, which is equivalent to $4 \pmod{6}$

Q1.3 Exponentiation
1 Point

What is $8^{70} \pmod 7$?

- ○ 0
- ◉ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5
- ○ 6

Explanation

We have that $8 \equiv 1 \pmod 7$, and $1^{70} \equiv 1 \pmod 7$.

Q1.4
1 Point

Which of the following sets is modular arithmetic defined on for this course?

- ◉ $\mathbb{Z}$ Integers
- ○ $\mathbb{Q}$ Rationals
- ○ $\mathbb{R}$ Reals
- ○ $\emptyset$ Empty

Explanation

Modular arithmetic is defined over the Integers. Intuitively, out of the above sets, the idea of a remainder only makes sense for Integers

Q2 Multiplicative inverses

2 Points

Indicate whether following are multiplicative inverses of $2 \pmod 7$.

Q2.1

1 Point

3

- ( ) Inverse
- (•) Not an inverse

Explanation

$2 \times 3 = 6 \not\equiv 1 \pmod 7$

Q2.2

1 Point

4

- (•) Inverse
- ( ) Not an inverse

Explanation

$2 \times 4 = 8 \equiv 1 \pmod 7$

Q3 Modular Solutions

2 Points

Q3.1

1 Point

Solve for x in $5x \equiv 3 \pmod{6}$.

- ( ) No solution exists
- ( ) 0.6
- ( ) 1
- (•) 3
- ( ) 5

Explanation

$5 \cdot 3 \equiv 15 \equiv 3 \pmod{6}$

Q3.2

1 Point

Solve for x in $2x \equiv 3 \pmod{6}$.

- (•) No solution exists
- ( ) 1
- ( ) 1.5
- ( ) 3
- ( ) 5

Explanation

$2x$ is even, and its remainder when divided by an even number will also be even. Thus $2x \pmod{6}$ can never be equal to 3.